



**RESEARCH ARTICLE.....**

# Design, technical aspects and construction of FRP gillnetters of Ratnagiri, Maharashtra

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**ABSTRACT.....** The overall length, breadth and depth of FRP gillnetters in Ratnagiri varied from 4.57 to 13.00 m, 0.84 to 3.55 m and 0.46 to 1.22 m, respectively. FRP gillnetters were motorized/mechanised and were either fitted with inboard or outboard engine, having horse power ranging from 3.32 to 99.27 hp with an average speed of 3 to 7 km. The gross tonnage ranged from 0.32 to 8.87 t. FRP inboard engine gill netters above 9 m OAL length, had half or full cabin. Construction cost of 9 to 13 m length FRP gillnetter, ranged from Rs. 1.80 to 6.30 Lakhs and had an average life of 35 to 40 years. All the FRP gillnetters were built using the female mould technique.

**KEY WORDS.....** Gillnetters, FRP, Design, Technical aspects, Construction

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## INTRODUCTION.....

Gillnetters ranging from 3.15 to 13.00 m were the most commonly used fishing boats by the maximum number of fishermen from Ratnagiri. FRP was most commonly used material for construction of gillnetters and is becoming very popular among the fishermen community of Ratnagiri. FRP gillnetters of 9 to 13 m size, either fitted with inboard or outboard engine have become very popular and are extensively used for gill netting operations in near shore waters. Taking a cue from gillnet operators many trawl owners have started replacing their wooden trawlers with 60 footer FRP trawlers and it is very likely that the Purse seine owners will follow suit. The present study was undertaken to document the design, technical specifications and stages

of construction of FRP gillnetters operated from Ratnagiri.

## RESEARCH METHODS.....

Mirkarwada minor fishing harbor situated on the west of the Ratnagiri city about 2 km away from Ratnagiri with a geographical distribution of  $160^{\circ} 59' 42''$  N latitude and  $730^{\circ} 16' 14''$  E longitude was chosen for the present study. The detail information regarding the design of FRP gillnetters were undertaken by physically sampling the units and by collecting the information from gillnet operators. Collected data was analyzed for the required parameters with the appropriate statistical procedures wherever required (Snedecor and Cochran, 1967). The design of FRP gillnetters was prepared and

was drawn to the scale and depicted in the offset tables.

## RESEARCH FINDINGS AND ANALYSIS.....

The detailed technical specifications of FRP gillnetters ranging from 9 to 13.00 m in overall length, operating from Mirkarwada landing center, Ratnagiri are stated in Table 1 and their design is depicted in Fig 1. Types of FRP gillnetters are presented in Plate 1 and their stages of construction are depicted in Plate 2.

It was observed that, FRP gillnetters had curved pointed stem, broad stern, well defined keel and round bottom 'U' shaped hull, fitted with rudder at aft side of the vessel and were propelled by engines of 3.32 to 99.27 hp. Vessel fitted with 3 to 20 hp inboard diesel engine obtained speed of 2 to 3 km. Similarly, 20 to 40 hp engine resulted 3 to 4 km whereas boats fitted with engines above 40 hp obtained speed up to 5 to 7 km.

Half or full cabin was constructed for 9 to 13.00 m FRP gillnetters. Half cabin was constructed only to cover the inboard engine. Steering of vessel was carried out with the help of rudder and tiller present at back side of the boat attached to the hull. Full cabin was positioned at amidships and was observed in larger FRP gillnetters. The cabin was 6 feet in length, 5 feet in breadth and 5 feet in height. Cabin was used to cover the inboard engine as well as for resting purpose.

It was observed that in Ratnagiri, the FRP gillnetters were built using the female mould technique. This technique is applicable in mass production of the same design of the gillnetters. The mould can produce a minimum of 15 number of gillnetters or even more if the mould is properly handled and maintained during the production process. Basically, two main moulds are initially constructed for the hull and the superstructure of the gillnetter. For FRP gillnetter construction, Chopped Strand Mat (CSM) and Woven Roving (WR) Glass Wool, Polyester Wool Mat Strands were used in combination with chemical binders to form the FRP layers. These layers were alternatively placed to give a rigid structure. Polyester resin in unsaturated form was used as adhesive

as it has resistance to water absorption as well as good adhesive properties. Common resins used were isophthalic (Iso) or neopentyl glycol (Iso-NPG).

Before starting of the construction, required size of the FRP gillnetter was determined by the type of targeted fishing and appropriate mould was selected and cleaned thoroughly. The mould was basically of folding type, which was selected, set and tightened with the nut and bolts, from outer side. Then wax was applied on the inner surface of the mould with the help of painting brush for smooth finish. The name of the vessel and registration format was pasted on the inner side of the gillnetter, printed in mirror image so that it can be imposed on the outer side of the gillnetter hull. The colour of the gillnetter was decided first and according to the choice of the boat owner it was prepared by mixing the desired shade of the colour, in resin. The local practice of two or three colour band combination were normally observed during the study. To separate each section of colour from other, cello tape or plastic adhesive tape was used, so that different colour patterns did not mix with each other. Due to use of resin, the colour dried speedily (Plate 2).

The next step was the application of layers of the glass wool and polyester wool. First of all, the binder was applied on the inner side of the prepared mould and then the mat of glass wool was applied on it. After half an hour when it was dried, the binder was applied on the glass wool layer and then polyester wool mat layer were applied on it. To increase the strength and to attain the required thickness 5 to 6 layers of glass wool and polyester wool were used, alternately. In the last layer colour was applied as per the requirement. The gillnetter was kept in the mould for 2 to 3 days, until it was completely dried. After drying, the boat was removed from the mould for undertaking further fittings.

Wooden beams were fixed on the gillnetter for various sections like fish hold, ice hold etc. These beams were fixed by nut and bolts and then covered by glass wool and polyester wool layer. Fish holds in 1 to 2 numbers of 1 to 1.5 t capacity and one gear hold at fore side of

**Table 1 : Specifications of FRP gillnetters (9 to 13m LOA) operating from Ratnagiri**

Sr. No.	Specifications	Mean $\pm$ SE	Minimum	Maximum
1.	Overall length (m)	9.78 $\pm$ 0.0825	9.00	13.00
2.	Breadth at midship (m)	2.32 $\pm$ 0.0458	1.75	3.05
3.	Depth of vessel (m)	0.95 $\pm$ 0.0225	0.70	1.22
4.	Horse power	13.83 $\pm$ 1.6511	3.32	99.27
5.	GRT	4.11 $\pm$ 0.2550	0.32	8.87



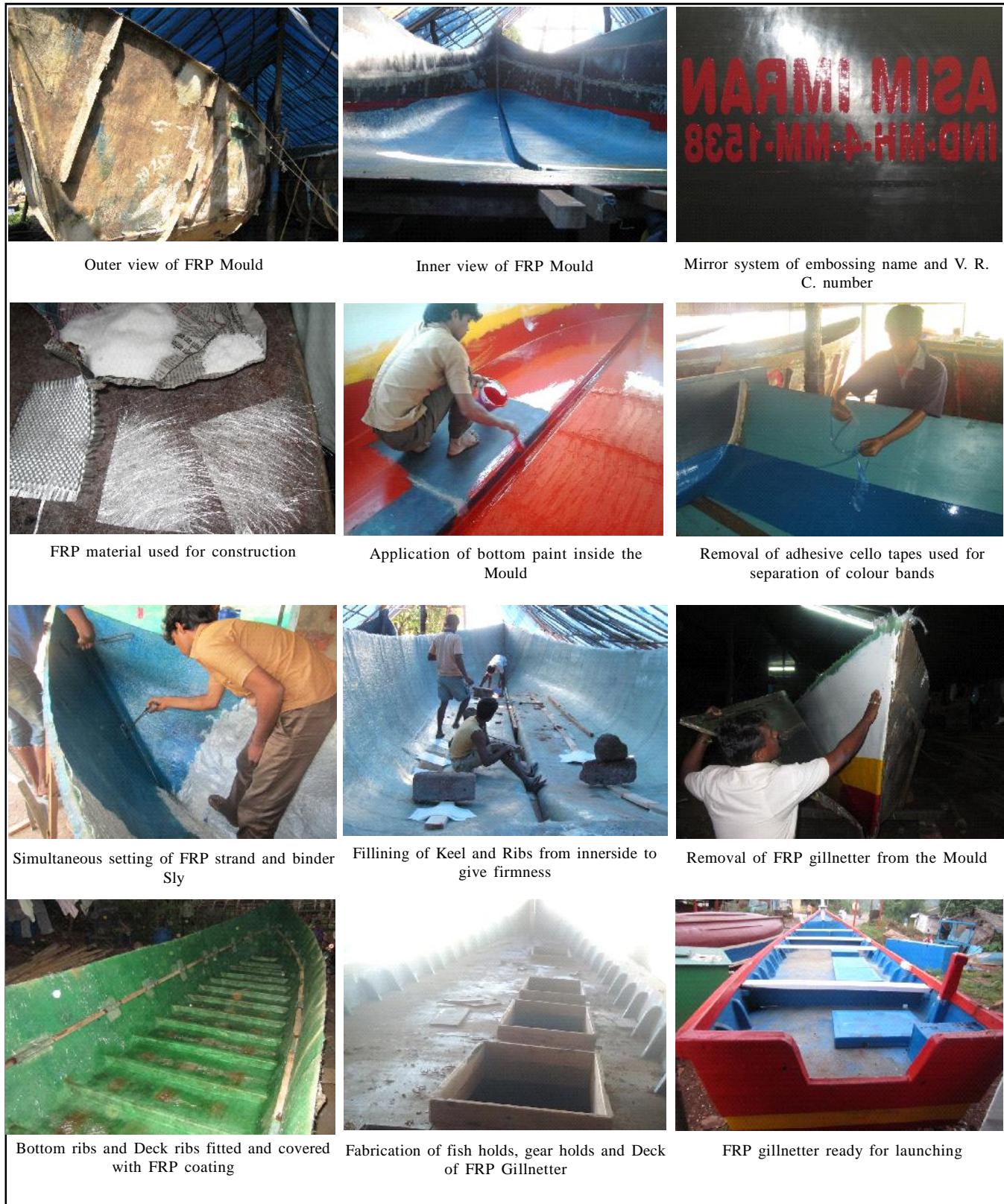
Plate 1 : FRP gillnetters of Ratnagiri

the cabin, to store the fishing net were normally provided.

In Ratnagiri, the construction of FRP gillnetters was carried out by expert and skilled experienced craftsmen locally called as *Mestries* without use of any design drawing or offset table. They constructed the gillnetters exclusively on the basis of their decades of experience in the field. FRP gillnetter of 9 to 13 m in length, costs approximately Rs. 1.80 to 6.30 lakhs. Average life of the FRP gillnetter was around 35 to 40 years, if maintained properly by following a strict maintenance schedule.

Fibre glass has been used in the traditional boat building industry in Malaysia since the 1980s. It began with the application of FRP to drape the whole wooden

hull instead of replanting it. This technique gave good results in which the hull had less problems with leakage and attack of marine growths and hence increased the hull life. This led to more constructions of FRP boats with the whole hull made of fibre glass. Craft used for marine fishing along the Andhra Pradesh coast was studied by Chenubhotla *et al.* (1999) and found that mechanized fibre glass boats, locally known as *Mara Padva* were built with synthetic fibre glass material. Chaudhary (1993) discussed design aspects of small fishing boats for operating gill nets in shallow waters made of FRP. Similar type of study was undertaken by Shamshuddin (2003) in which he studied small scale



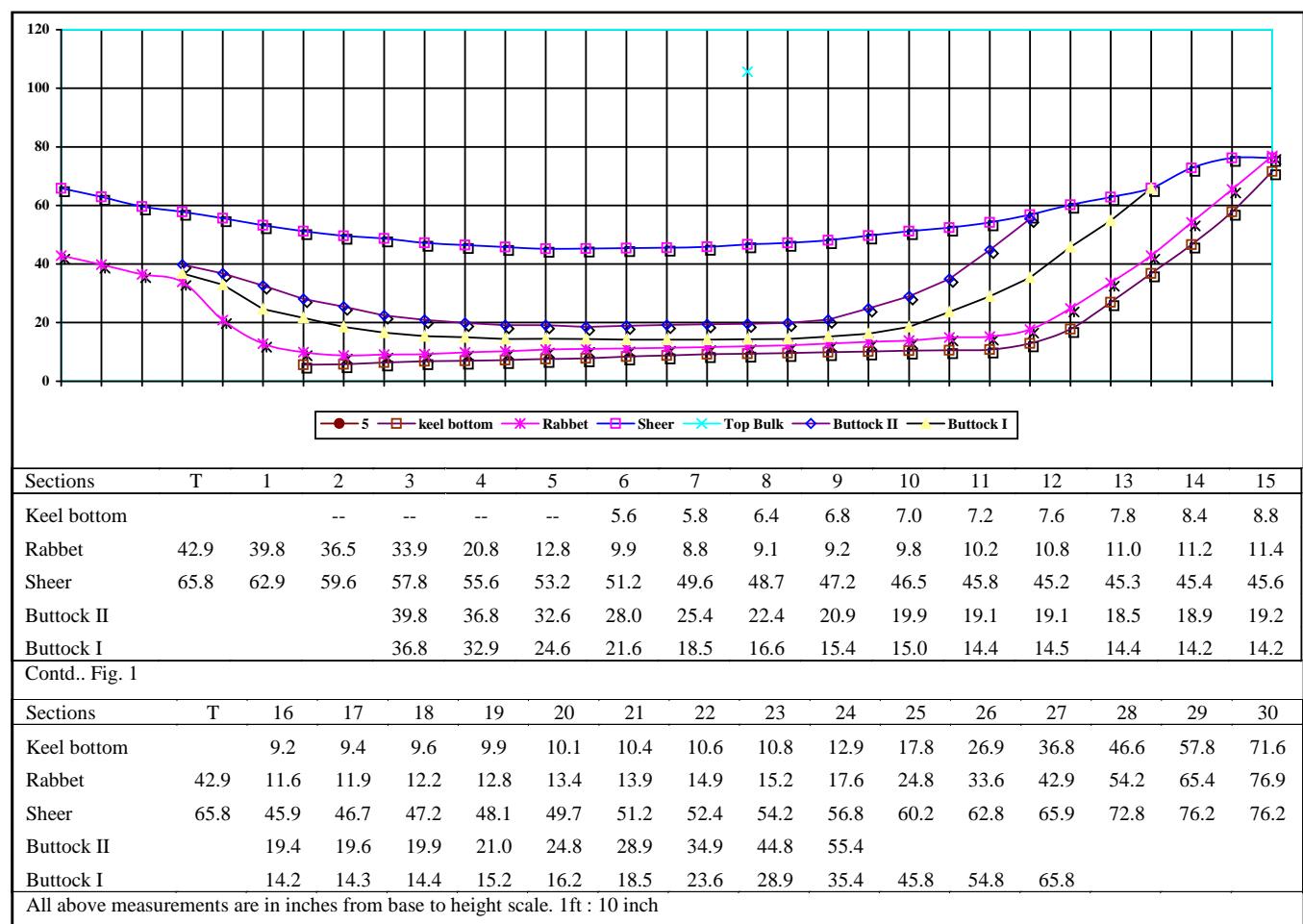
**Plate 2 : Construction stages of FRP gillnetters of Ratnagiri**

fishery fleet, which was made up of FRP. Edwin (2009) reported, that FRP is emerging as a new material for use in the artisanal fisheries sector. FRP canoes for gill netting in the inland and coastal waters have been operational for the past one decade. She also stated that FRP can be utilized for the construction of small open canoes to medium sized fishing craft with amenities like fish hold, storage space for fishing gear and fishing accessories and provision for installation of outboard motors. Kazi (2010) found various types of gillnetters along the Ratnagiri coast and observed that, FRP boats in the motorised sector were fitted with outboard motors of 9.9 to 15 hp. Fishing vessels in the mechanized sector comprising of FRP gillnetters were fitted with inboard diesel engines ranging from 10 to 50 hp.

Nasar and Baiju (1993) studied the FRP as an alternative for wood in respect with construction material and discussed advantages of FRP over wood and stated

that FRP had advantages like series production capabilities, corrosion resistance, long life, less maintenance cost, smooth lines leading to less resistance and high strength relative to its weight. Chenubhotla *et al.* (1999) observed the mechanized fiber glass boats along the Andhra Pradesh coast. Conceptual design of a FRP fishing boat for traditional fisheries in Malaysia was described by Shamshuddin (2003).

FRP gill net fishing vessel of 9 to 10.5 m overall length was observed by Pajot (1980) in Sri Lanka. Dayaratne (1988) reported 5 to 7 m length FRP gill netters for catching small pelagic fishes along the coast of Sri Lanka. Similarly, Nasar and Baiju (1993) during the study of boat building material found the FRP as an alternative for wood as construction material for 7.60 m length over all vessel. While mechanized fibre glass fishing vessel built with synthetic fibre glass material was studied by Chenubhotla *et al.* (1999) along the Andhra



**Fig. 1 : Design of FRP Gillnetters (above 9 m OAL) of Ratnagiri, Maharashtra**

Pradesh coast where he found 8.45 m overall length fishing vessel locally known as *Mara padva* in operation. Nasar and Baiju (1993) observed FRP as a boat building material for gillnetter and also found gillnetters with maximum breadth of 2.20 m in Lakshadweep. Similarly, Chenubhotla *et al.* (1999) observed FRP fishing vessel of around 2.27 m breadth in operation along the Andhra Pradesh coast. Fishing vessel having similar depth, as observed during present study, of 1.20 m was observed by Nasar and Baiju (1993) in Lakshadweep while Chenubhotla *et al.* (1999) observed 0.82 m along Andhra Pradesh coast.

Pajot (1980) reported FRP gill net fishing vessel fitted with inboard diesel engines of 25 to 55 hp along Shri Lanka coast. For FRP gillnetters in Ratnagiri, the horse power ranged from 3.32 to 99.27 hp. Observations falling in the similar range have been recorded by Nasar and Baiju (1993) during his study were in Kirloskar inboard engine of 21 hp were used for gill net operation in Lakshadweep. Chenubhotla *et al.* (1999) had studied fishing vessel along the Andhra Pradesh coast where he observed that 10 hp inboard diesel engine was fitted to the FRP fishing vessel.

Carrying capacity of 3.5 to 16 t of gill net fishing

vessel was reported by Pajot (1980) in Shri Lanka. Fishing vessels gross tonnage recorded during the current research work varied from 0.32 to 8.87 t. Chenubhotla *et al.* (1999) found FRP fishing vessel of 2.5 t capacity along the coast of Andhra Pradesh.

### **Conclusion :**

The documented information on the design and technical specifications of the FRP gillnetters of Ratnagiri, Maharashtra would serve as a base line information for the technological modifications the gillnetters may undergo to increase their efficiency in the coming years.

### **Acknowledgement :**

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